

Central Line-associated Bloodstream Infections (CLABSIs) Reporting in Illinois Acute Care Hospitals, 2014

Illinois hospitals have been reporting CLABSI data from adult intensive care units (ICU) to the Illinois Department of Public Health (IDPH) using the CDC’s National Healthcare Safety Network (NHSN) since October, 2008. Reporting of CLABSI data from both PICUs and NICUs commenced in October, 2009. CLABSI data are summarized using the standardized infection ratio (SIR), a summary statistic used to measure relative difference in CLABSI occurrence during a reporting period, in this case 2014, compared to a common referent period (national data collected during 2006-2008). For additional information on Standardized Infection Ratios (SIRs), and confidence intervals (CIs), see the methodology section of the Illinois Hospital Report Card website.

<http://www.healthcarereportcard.illinois.gov/contents/view/methodology>

Table 1. Summary of Central Line-associated Bloodstream Infection (CLABSIs) by Type of Intensive Care Unit (ICU), 2014

Intensive Care Unit (ICU) Type	Number of Units Reported	Number of CLABSIs		Standardized Infection Ratio (SIR)	95% Confidence Interval (SIR)		Statistical Interpretation (compared to National baseline)
		Observed	Predicted		Lower	Upper	
All ICU Combined	247	335	746	0.45	0.403	0.499	Lower
Adult ICU	185	247	533	0.46	0.409	0.524	Lower
Neonatal (NICU)	42	68	133	0.51	0.400	0.644	Lower
Pediatric (PICU)	20	20	81	0.25	0.155	0.375	Lower

Table 1 provides a snapshot summary of central line-associated bloodstream infections in Illinois ICUs during 2014. For all ICU combined, 335 CLABSIs were reported compared to 746 CLABSIs predicted, for an SIR of 0.45 (95% CI 0.403, 0.499). This translates to a 55% reduction compared to the national referent period noted above. This statistically significant reduction in CLABSIs was achieved in all three intensive care settings – adult ICUs (AICU), neonatal ICUs (NICU) and pediatric ICUs (PICU). The reduction of CLABSIs was 54% in adult ICUs, 49% in NICUs, and 75% in PICUs, respectively.

Joinpoint Trend Analysis:

Trends in CLABSI SIR in Illinois Acute Care Hospitals were analyzed using Joinpoint regression version 4.1. Joinpoint regression program is a trend analysis software developed by the US National Cancer Institute for the analysis of data from the Surveillance Epidemiology and End Results Program.¹ The joinpoint program is used to find the best-fit line through several years of data. This method describes changes in data trends by connecting several different line segments on a log-scale at “joinpoints.”

Analysis starts with the minimum number of joinpoints (i.e., 0 joinpoint, representing a straight line) and tests whether more joinpoints are statistically significant and must be added to the model. Tests of significance use a Monte Carlo permutation method with each joinpoint denoting a statistically significant ($p = .05$) change in trend.¹

In addition, an annual percent change (APC) in SIR values for each line segment and the corresponding 95% confidence interval were estimated. The APC is tested to determine whether a difference exists from the null hypothesis of no change (0%).¹ Refer to the following table (Table 2) for the APC for all ICU types.

Table 2. Changes in CLABSI Standardized Infections Ratios (SIRs) in Illinois ICUs from 2009 - 2014

Year	2009	2010	2011	2012	2013	2014	Annual Percent Change (APC)
All ICUs Combined	0.86	0.67	0.58	0.54	0.46	0.45	-11.99 ^
Adult ICUs	0.87	0.65	0.60	0.61	0.49	0.46	-10.86 ^
NICUs	0.77	0.66	0.48	0.41	0.41	0.51	*
PICUs	0.95	0.85	0.66	0.34	0.36	0.25	-25.72 ^

^ The Annual Percent Change (APC) is significantly different from zero at $\alpha = 0.05$

* For NICU, one Joinpoint was observed, see Table 4 and Figure 4 for results

Figure 1. CLABSI SIR in Illinois Hospital ICUs (combined) from 2009 – 2014

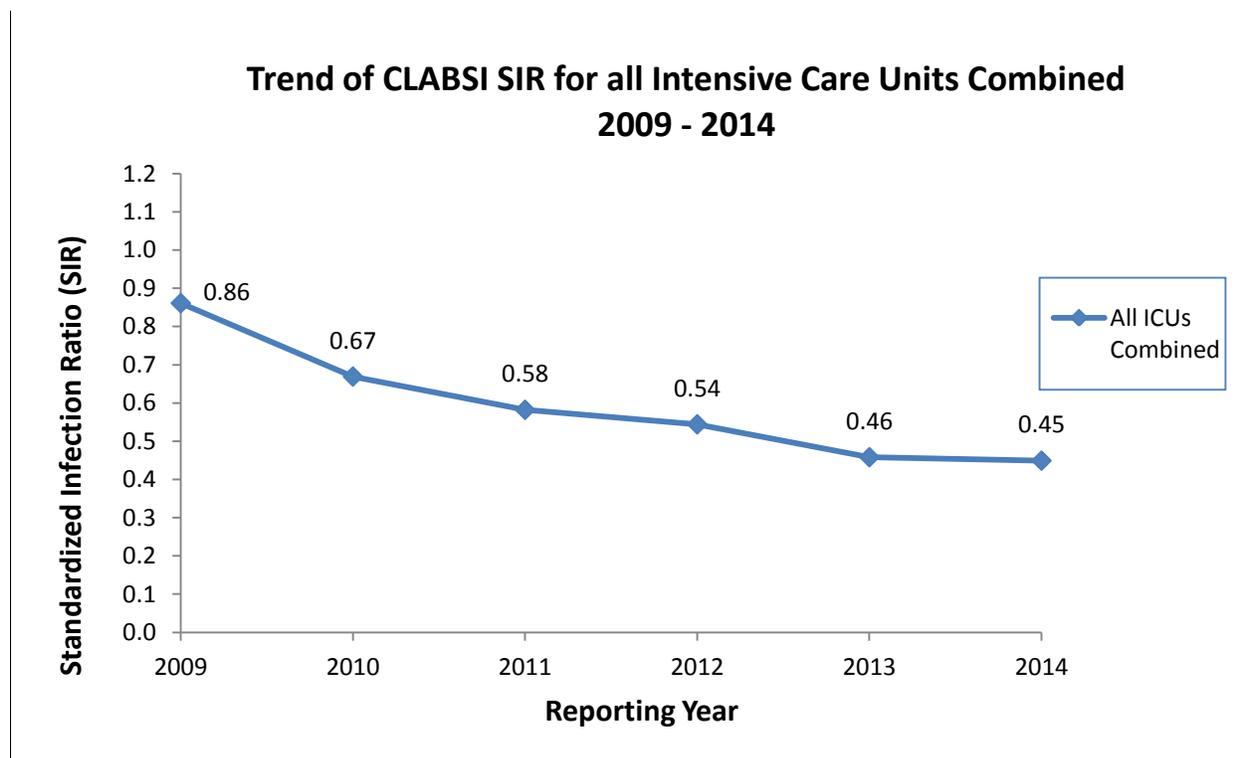
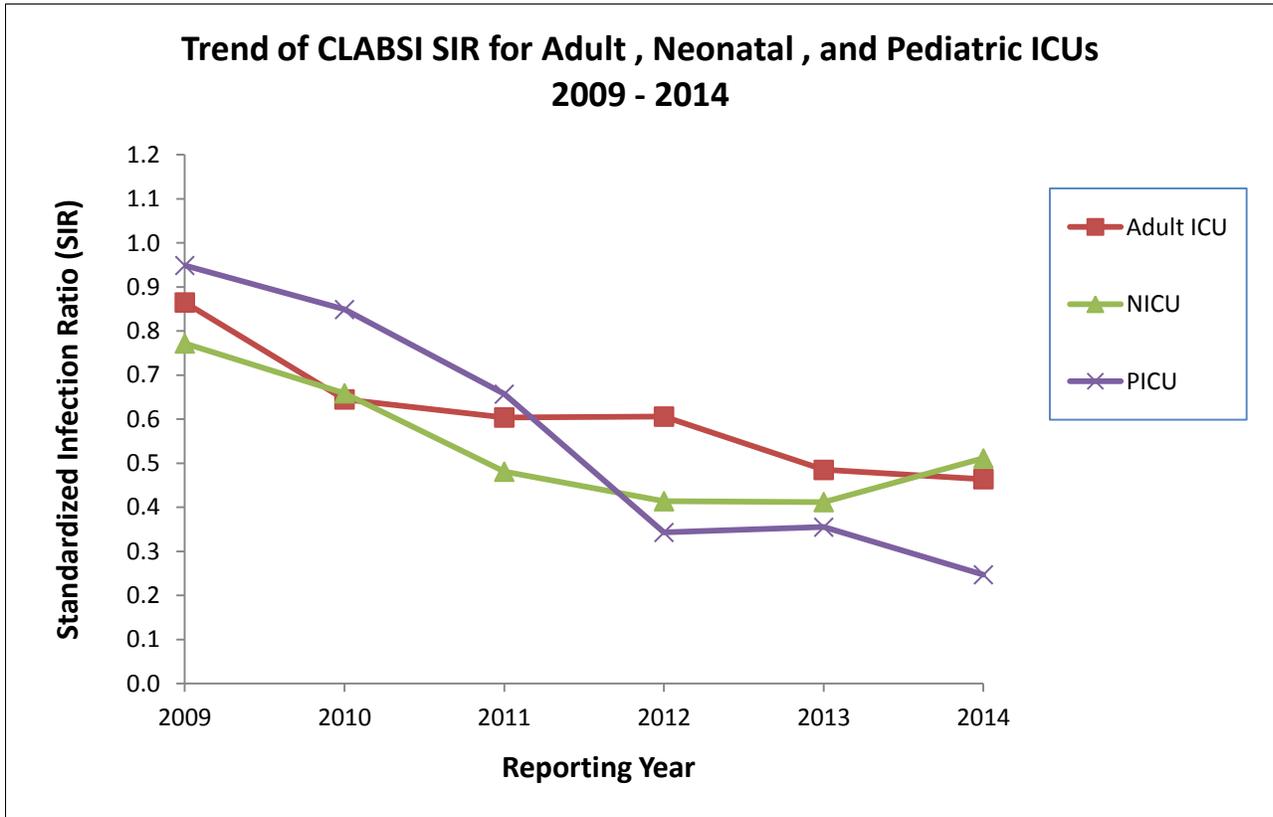


Figure 2. Trend of CLABSIs SIR in Adult ICU, Neonatal ICU, and Pediatric ICU from 2009 – 2014

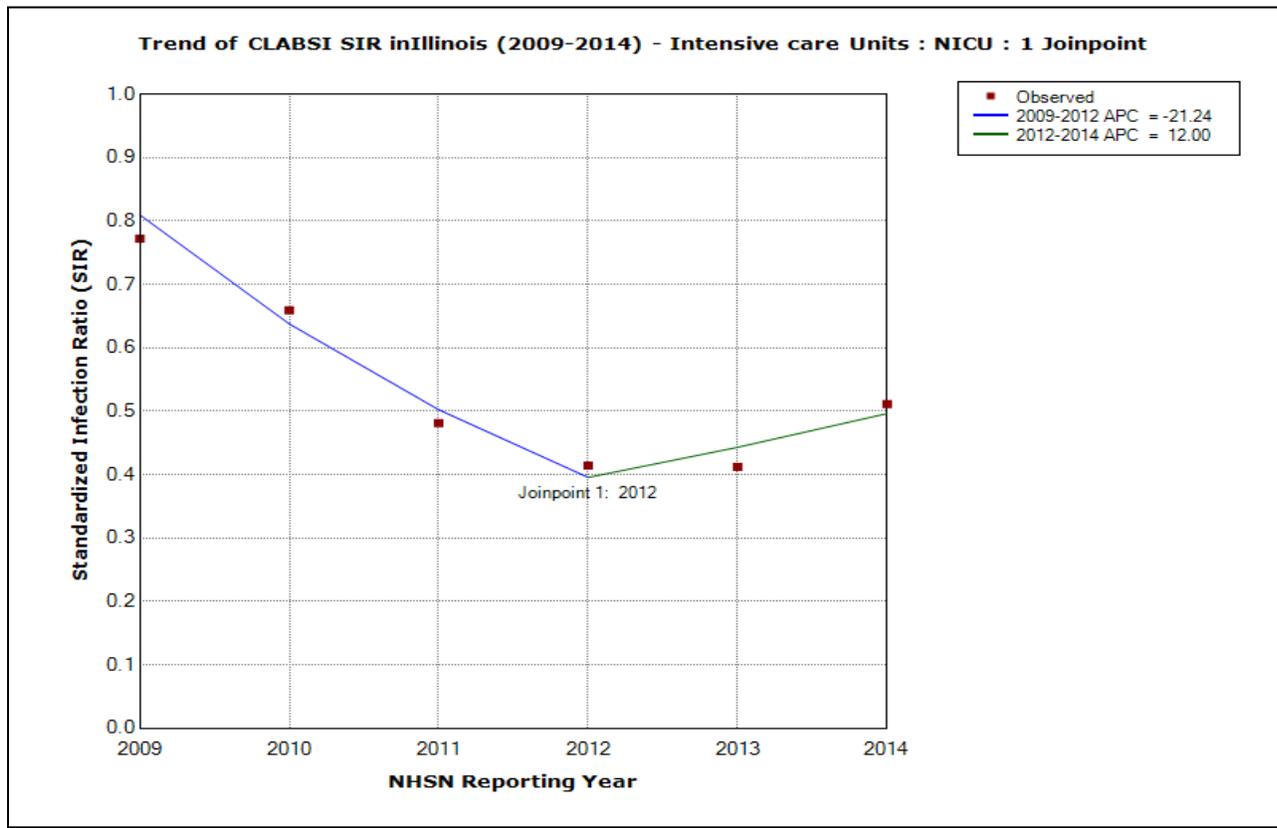


As shown on Figure 2 there is a slight increase in CLABSI SIR for NICU from 2013 – 2014. Joinpoint analysis output for NICU quantified the percent increase and is displayed in Table 3 and Figure 3 below.

Table 3. Annual Percent Change in CLABSI SIR in Neonatal ICUs, 2009 - 2014

ICU Type	Joinpoint Segment	Annual Percent Change (APC)	Statistical Interpretation (APC)	p-value (APC)
Neonatal ICU	1	-21.24	Not Statistically Significant	0.1465
	2	12.00	Not Statistically Significant	0.2038

Figure 3. Joinpoint Analysis of CLABSI SIR in Neonatal ICUs, 2009 – 2014



Summary

The SIR for CLABSIs in Adult ICU, Pediatric ICU, and Neonatal ICU are trended over time in Figures 1 through 3. There were no significant change points observed for all CLABSI combined, adult ICU, or pediatric ICU data. The Joinpoint results show that the overall Illinois SIRs for CLABSIs have been steadily decreasing on the average of 12% per year for the 6-year period of 2009 through 2014 (Table 2). The annual percent change of SIRs for Adult ICU and PICU have also seen the steady decrease of 11% and 26% per year, respectively, for this same time period (Table 2). The overall CLABSI, adult ICU, and pediatric ICU annual percent change were significantly different from zero at $\alpha = 0.05$.

For Neonatal ICU, one significant change point in the data was observed in 2012 (Figure 3). From 2009 through 2011 there was a steady decrease of 21% per year in CLABSI SIR, and then a change point occurred in 2012 as the trend increased through 2014 by an average of 12% per year. This increase, however, is not statistically significant.

References:

¹ Kim HJ, Fay MP, Feuer EJ, Midthune DN. Permutation tests for joinpoint regression with applications to cancer rates. *Stat Med* 2000;19:335–51.